$costvar$, c
$termvar$, x, y, z, f
$baseAttackVars$, N
$baseAttackTVars$, n
$index$, i, j, k

$$
\begin{array}{lll}
A,\ B,\ C,\ E,\ F,\ D,\ T & ::= & \\
& \mid & N \\
& \mid & A \odot B \\
& \mid & A \rhd B \\
& \mid & A \sqcup B \\
& \mid & A \multimap B \\
& \mid & A \rightharpoonup B \\
& \mid & B \leftharpoonup A \\
& \mid & A \circ\!\!-\!\!\circ B \\
& \mid & (A) \\
& \mid & A
\end{array}
$$

$$
\begin{array}{lll}
p & ::= & \\
& \mid & - \\
& \mid & x \\
& \mid & p_1 \oplus p_2 \\
& \mid & p_1 \odot p_2 \\
& \mid & p_1 \rhd p_2 \\
& \mid & p_1 \sqcup p_2 \\
& \mid & (p)
\end{array}
$$

$$
\begin{array}{lll}
\Gamma,\ \Delta & ::= & \\
& \mid & * \\
& \mid & A \\
& \mid & \Gamma(\Gamma') \\
& \mid & \Gamma, \Gamma' \\
& \mid & \Gamma; \Gamma' \\
& \mid & \Gamma_1 \blacksquare \Gamma_2 \\
& \mid & \Gamma_1 \bullet \Gamma_2 \\
& \mid & \Gamma_1 \circ \Gamma_2 \\
& \mid & (\Gamma) \\
& \mid & \Gamma
\end{array}
$$

$\boxed{\Gamma_1 \vdash \Gamma_2}$ Context Morphisms

$$\frac{}{\Gamma \vdash \Gamma}\ \text{C\_ID}$$

$$\frac{\Gamma_1 \vdash \Gamma_2 \quad \Gamma_2 \vdash \Gamma_3}{\Gamma_1 \vdash \Gamma_3}\ \text{C\_C}$$

$$\frac{}{(\Gamma_1 \circ \Gamma_2) \circ \Gamma_3 \vdash \Gamma_1 \circ (\Gamma_2 \circ \Gamma_3)}\ \text{C\_A1}$$

$$\frac{}{\Gamma \circ * \vdash \Gamma}\ \text{C\_U1}$$

$$\frac{}{* \circ \Gamma \vdash \Gamma}\ \text{C\_U2}$$

$$\frac{}{\Gamma(A, B) \vdash \Gamma(B, A)}\ \text{C\_E1}$$

$$\frac{}{\Gamma(A \bullet B) \vdash \Gamma(B \bullet A)}\ \text{C\_E2}$$

$$\frac{}{\Gamma(A \blacksquare B) \vdash \Gamma(B \blacksquare A)}\ \text{C\_E3}$$

$$\frac{}{\Gamma((\Delta_1;\Delta_3) \bullet (\Delta_2;\Delta_4)) \vdash \Gamma((\Delta_1 \bullet \Delta_2);(\Delta_3 \bullet \Delta_4))}\ \text{C\_I1}$$

$$\frac{}{\Gamma((\Delta_1;\Delta_3) \blacksquare (\Delta_2;\Delta_4)) \vdash \Gamma((\Delta_1 \blacksquare \Delta_2);(\Delta_3 \blacksquare \Delta_4))}\ \text{C\_I2}$$

$$\frac{}{\Gamma((\Delta_1 \blacksquare \Delta_2);(\Delta_3 \blacksquare \Delta_4)) \vdash \Gamma((\Delta_1;\Delta_3) \blacksquare (\Delta_2;\Delta_4))}\ \text{C\_I2I}$$

$$\frac{}{\Gamma((\Delta_1 \bullet \Delta_3) \blacksquare (\Delta_2 \bullet \Delta_4)) \vdash \Gamma((\Delta_1 \blacksquare \Delta_2) \bullet (\Delta_3 \blacksquare \Delta_4))}\ \text{C\_I3}$$

$$\frac{}{\Gamma((\Delta_1 \blacksquare \Delta_2) \bullet (\Delta_3 \blacksquare \Delta_4)) \vdash \Gamma((\Delta_1 \bullet \Delta_3) \blacksquare (\Delta_2 \bullet \Delta_4))}\ \text{C\_I3I}$$

$$\frac{}{\Gamma(A;(\Delta_1 \bullet \Delta_2)) \vdash \Gamma((A;\Delta_1) \bullet (A;\Delta_2))}\ \text{C\_D1}$$

$$\frac{}{\Gamma((A;\Delta_1) \bullet (A;\Delta_2)) \vdash \Gamma(A;(\Delta_1 \bullet \Delta_2))}\ \text{C\_D2}$$

$$\frac{}{\Gamma(A,(\Delta_1 \bullet \Delta_2)) \vdash \Gamma((A,\Delta_1) \bullet (A,\Delta_2))}\ \text{C\_D3}$$

$$\frac{}{\Gamma((A,\Delta_1) \bullet (A,\Delta_2)) \vdash \Gamma(A,(\Delta_1 \bullet \Delta_2))}\ \text{C\_D4}$$

$$\frac{}{\Gamma(\Delta_1) \vdash \Gamma(\Delta_1 \blacksquare \Delta_2)}\ \text{C\_Weak}$$

$$\frac{}{\Gamma(\Delta \blacksquare \Delta) \vdash \Gamma(\Delta)}\ \text{C\_contract}$$

$\boxed{\Gamma \vdash A}$ Attack Tree Logic (ATL)

$$\frac{}{B \vdash B}\ \text{L\_var}$$

$$\frac{}{* \vdash N}\ \text{L\_node}$$

$$\frac{\Gamma_1 \vdash \Gamma_2 \quad \Gamma_2 \vdash A}{\Gamma_1 \vdash A}\ \text{L\_Ctx}$$

$$\frac{\Gamma \vdash A \quad \Delta \vdash B}{\Gamma \bullet \Delta \vdash A \odot B}\ \text{L\_paraI}$$

$$\frac{\Gamma \vdash A \quad \Delta \vdash B}{\Gamma \blacksquare \Delta \vdash A \sqcup B}\ \text{L\_choiceI}$$

$$\frac{\Gamma \vdash A \quad \Delta \vdash B}{\Gamma;\Delta \vdash A \rhd B}\ \text{L\_seqI}$$

$$\frac{\Gamma \vdash A \odot B \quad \Delta(A \bullet B) \vdash C}{\Delta(\Gamma) \vdash C}\ \text{L\_paraE}$$

$$\frac{\Gamma \vdash A \sqcup B \quad \Delta(A \blacksquare B) \vdash C}{\Delta(\Gamma) \vdash C}\ \text{L\_choiceE}$$

$$\frac{\Gamma \vdash A \rhd B \quad \Delta(A;B) \vdash C}{\Delta(\Gamma) \vdash C}\ \text{L\_seqE}$$

$$\frac{\Gamma, A \vdash B}{\Gamma \vdash A \multimap B}\ \text{L\_limpI}$$

$$\frac{\Gamma \vdash A \multimap B \quad \Delta \vdash A}{\Gamma, \Delta \vdash B}\ \text{L\_limpE}$$

$$\frac{\Gamma; A \vdash B}{\Gamma \vdash A \rightharpoonup B}\ \text{L\_RlimpI}$$

$$\frac{\Gamma \vdash A \rightharpoonup B \quad \Delta \vdash A}{\Gamma; \Delta \vdash B}\ \text{L\_RlimpE}$$

$$\frac{A; \Gamma \vdash B}{\Gamma \vdash B \leftharpoonup A}\ \text{L\_LlimpI}$$

$$\frac{\Gamma \vdash B \leftharpoonup A \quad \Delta \vdash A}{\Delta; \Gamma \vdash B}\ \text{L\_LlimpE}$$

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Definition rules:         34 good    0 bad
Definition rule clauses:  48 good    0 bad
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